

1. A flotation separation apparatus for separating and classifying diverse, liquid-suspended solids, said flotation separation apparatus comprising a first chamber and a second chamber stacked below said first chamber in fluid communication with said first chamber, the  
5 improvement comprising:

- (a) a first set of a plurality of high volume air bubble infusers spaced in said first chamber;  
and,
- 10 (b) a second set of a plurality of unique high volume air bubble infusers spaced in said second chamber wherein each unique high volume air bubble infuser comprises:
  - (i) a structure having formed centrally in a  
15 top surface thereof a circular cavity defining an interior circumferential wall and centrally in a bottom surface parallel to said top surface a bubble-water discharge outlet coaxial with an  
20 axis of said circular cavity;
  - (ii) a lid member secured to said top surface of said structure;

(iii) a water inlet port formed in said circular cavity for injecting a water stream into said circular cavity offset from said axis and perpendicular to said axis;

(iv) an air inlet port formed in said circular cavity for injecting an air stream into said water stream at an acute angle; and,

(v) a plurality of stationary impinging plates projecting from said interior circumferential wall into said circular cavity and spaced circumferentially in series therealong.

2. The apparatus of CLAIM 1, wherein said water stream and said air stream create an injection stream which impinges in series upon said stationary impinging plates to create, divide and subdivide repeatedly in series air bubbles.

3. The apparatus of CLAIM 2, wherein said circular cavity is a relatively narrow circular cavity having injected therein at a relatively high rate said injection stream to create a sufficient impact force through the series of stationary impinging plates to maximize the rate of the creation of said air bubbles and the discharge thereof through said bubble-water discharge outlet.

4. The apparatus of CLAIM 3, wherein said water stream flows at a rate significantly faster than said air stream.

5. The apparatus of CLAIM 3, wherein said air stream is injected into said water stream at an angle significantly less than 90 degrees.

6. The apparatus of CLAIM 1, wherein there are ten (10) impinging plates incrementally equally spaced over substantially 270 degrees of said circular cavity.

7. The apparatus of CLAIM 1, wherein said discharge outlet has a diameter of 1 ½ inches.

8. The apparatus of CLAIM 7, wherein said air inlet port has a diameter of approximately  $\frac{3}{8}$  of an inch and said water inlet port has a diameter of approximately  $\frac{3}{4}$  of an inch.

5 9. The apparatus of CLAIM 1, wherein said structure is 8 inches x 8 inches x  $1\frac{1}{2}$  inches and said circular cavity is approximately 1 inch deep.

10 10. An high volume air bubble infuser for use in a flotation separation apparatus for separating and classifying diverse, liquid-suspended solids, said infuser comprising:

a circular cavity defined by an interior circumferential wall;

15 a plurality of stationary impinging plates projecting from the interior circumferential wall into the circular cavity and equally spaced circumferentially in series therealong wherein an injecting stream of water and air impinges upon said impinging plates in series to repeatedly create, divide and subdivide air bubbles as  
20 said injection stream transverses the series of impinging plates.

11. The infuser of CLAIM 10, wherein said circular cavity includes a discharge outlet and is a relatively narrow circular cavity having injected therein at a relatively high rate said injection stream to create a sufficient impact force through the series of stationary  
5 impinging plates to maximize the rate of the creation of said air bubbles and the discharge thereof through said discharge outlet.

12. The infuser of CLAIM 11, further comprising:  
10 a water inlet port formed in said circular cavity for injecting a water stream into said circular cavity offset from said axis and perpendicular to said axis; and,  
an air inlet port formed in said circular cavity for  
15 injecting an air stream into said water stream at an acute angle.

13. The apparatus of CLAIM 12, wherein said water stream flows at a rate significantly faster than said air stream.

14. The apparatus of CLAIM 13, wherein said air stream is injected into said water stream at an angle significantly less than 90 degrees.

15. The infuser of CLAIM 12, wherein said discharge outlet has a diameter of  $1 \frac{1}{2}$  inches.

16. The infuser of CLAIM 12, wherein said air inlet port has a diameter of approximately  $\frac{3}{8}$  of an inch and said water inlet port has a diameter of approximately  $\frac{3}{4}$  of an inch.

17. The infuser of CLAIM 12, wherein said circular cavity is formed in a structure which is 8 inches x 8 inches x  $1 \frac{1}{2}$  inches and said circular cavity is approximately 1 inch deep.

18. The infuser of CLAIM 12, further comprising a lid member secured to a top surface of said structure and having a portion extending beyond one side of said structure.

19. The infuser of CLAIM 12, wherein there are ten (10) impinging plates incrementally equally spaced over substantially 270 degrees of said circular cavity.